Claims

We Claim:

1. A system for transferring semiconductor wafers and related substrate objects between a wafer carrier having a carrier door and a carrier shell, and an environment isolated from outside ambient conditions, comprising:

a unified frame, including at least two vertical struts spaced apart and mounted to a lower support member and an upper support member, said frame defining at least one I/O port and a port door/carrier door storage area;

a carrier docking/isolation plate mounted to each said vertical strut;

a carrier advance assembly mounted to said lower support member, for supporting the wafer carrier, moving the wafer carrier towards said carrier docking/isolation plate, and moving the wafer carrier away from said carrier docking/isolation plate;

a port door assembly having a port door and a drive mechanism, said port door for engaging and mating with the carrier door, and said drive mechanism for moving said port door between said I/O port and said port door/carrier door storage area; and

a wafer handling robot mounted to said lower support member and positioned within the environment isolated from outside ambient conditions.

2. The system as recited in claim 1, wherein said vertical struts are substantially parallel to each other.

3. The system as recited in claim 1, wherein said carrier docking/isolation plate is removably mounted to each said vertical strut.

4. The system as recited in claim 3, wherein said carrier docking/isolation plate is transparent.

5. The system as recited in claim 1, wherein said port door/carrier door storage area has at least one perforated surface.

6. The system as recited in claim 1, wherein said wafer handling robot includes:

a linear drive mounted to said lower support member of said unified frame, having linear motion along an x axis;

a rotational drive mounted to said linear drive, for rotating about a theta axis;

a z axis linear drive extending from said rotational drive, having linear motion along a z axis, said z-axis being offset and substantially parallel to said theta axis; and

a radial drive removably mounted to said z axis linear drive, including at least one end effector having linear motion along a radial axis.

7. The system as recited in claim 6, wherein said radial axis rotates about said theta axis when said rotational drive rotates.

8. A system for transferring semiconductor wafers and related substrate objects between a wafer carrier having a carrier door and a carrier shell, and an environment isolated from outside ambient conditions, comprising:

a unified frame having an interior mounting surface and an exterior mounting surface that front end load components mount to, said exterior mounting surface being exposed to ambient outside conditions, and said interior mounting surface being isolated from ambient outside conditions, said unified frame creating at least one I/O port and a carrier door/port door storage area;

a carrier advance assembly mounted to said exterior mounting surface;

a carrier docking/isolation plate mounted to said exterior mounting surface;

a wafer engine mounted to said interior mounting surface; and

a port door assembly having a port door and a drive mechanism, said port door being slidably engaged with said unified frame, said drive mechanism for

moving said port door between said I/O port and said carrier door/port door storage area.

9. The system as recited in claim 8, wherein the system is mounted to a process tool such that the system is raised above the wafer fab floor and is supported by a support structure so that an open space underneath the system exists between the system and the wafer fab floor.

10. The system as recited in claim 8, wherein the system further includes a control box mounted to said exterior mounting surface.

11. A system for transporting wafers, comprising:

at least one front end load component selected from the group consisting of (i) a load port assembly, (ii) a fan/filter unit, (iii) a wafer handling robot, (iv) a FOUP docking/isolation plate, and (v) a port door assembly; and

a unified frame that said front end load components may mount to, said frame creating a single reference for precisely aligning said front end load components, said unified frame including at least two vertical struts mounted to an upper support member and a lower support member.

12. A system for transferring semiconductor wafers and related substrate objects between a wafer carrier having a carrier door and a carrier shell, and an environment isolated from outside ambient conditions, comprising:

a unified frame, including at least two vertical struts spaced apart and mounted to a lower support member and an upper support member, said frame defining at least one I/O port and a port door/carrier door storage area;

a transparent carrier docking/isolation plate mounted to each said vertical strut;

a carrier advance assembly mounted to said lower support member, said carrier advance assembly being exposed to said outside ambient conditions;

a port door assembly having a port door and a drive mechanism, said drive mechanism for moving said port door between said I/O port and said port door/carrier door storage area; and

a wafer handling robot located within the environment isolated from outside ambient conditions, including:

a linear drive mounted to said lower support member, having linear motion along an x axis;

a rotational drive mounted to said linear drive, for rotating about a theta axis;

a z axis linear drive extending from said rotational drive, having linear motion along a z axis, said z-axis being offset and substantially parallel to said theta axis; and

a radial drive removably mounted to said z axis linear drive, including at least one end effector having linear motion along a radial axis.

13. An EFEM for transporting semiconductor wafers and related substrates between a SMIF pod and an environment that is isolated from outside ambient conditions, comprising:

a unified frame having at least two vertical struts mounted to an upper support member and a lower support member, said frame defining an I/O port;

a wafer engine mounted to said lower support member, said wafer engine being positioned within the environment that is isolated from outside ambient conditions;

a SMIF pod advance assembly mounted to said lower support member, said pod advance assembly being exposed to the outside ambient conditions;

a SMIF pod docking plate mounted to each said vertical strut, said docking plate being exposed to the outside ambient conditions; and

said vertical struts of said unified frame provide a common reference that said wafer engine, said SMIF pod advance assembly, and said SMIF pod docking plate may align with.

14. The system as recited in claim 13, wherein said wafer engine includes:

a linear drive mounted to said lower support member, having linear motion along an x axis;

a rotational drive mounted to said linear drive, for rotating about a theta axis;

a z axis linear drive extending from said rotational drive, having linear motion along a z axis, said z-axis being offset and substantially parallel to said theta axis; and

a radial drive removably mounted to said z axis linear drive, including at least one end effector having linear motion along a radial axis.

15. The system as recited in claim 13, wherein said SMIF pod docking plate is transparent.